

TRAILS AND WATERFALLS IN PEDRO II: DIDACTIC DEVICES AS A METHODOLOGICAL PROPOSAL FOR OUTDOOR ACTIVITY PRACTICES

 <https://doi.org/10.63330/aurumpub.008-014>

Edson Osterne da Silva Santos¹, Raissa de Almeida Sousa², Francisco Welton Machado³, Kennedy José Alves da Silva⁴ and Noé da Silva Carvalho⁵

ABSTRACT

The use of educational tools can help in understanding the geographical spaces of fieldwork, promoting meaningful learning and moving away from traditional approaches. In this regard, this research focuses on highlighting the benefits of outdoor activities for people's well-being, especially with the support of educational devices that utilize geographic coordinates. The research methodology analyzed the 8.5 km trails of the Waterfall Circuit in Pedro II, Piauí, in 2022, using photographic records, educational tools like Relive, Strava, and the creation of a map in QGIS. The study also includes interviews about safety and the use of technologies, emphasizing the importance of guides, with key authors including Capra (2006) and Santos (1996), and the analysis of experiences followed a Vygotskian logic. The overall objective is to relate the experience of the trails and waterfalls in Pedro II to the practice of physical

¹ Specialist in Human and Social Sciences Applied to the World of Work (CEAD/UFPI/SEB/MEC)

Master's student at the Federal University of Piauí (UFPI), through the Office of Post Graduate Studies (PRPG), Center for Human Sciences and Letters (CCHL), and the

Post Graduate Program in Geography (PPGGEO), Academic Master's in Geography

– Class 14 (2024–2026)

E-mail: edsonosterne23@gmail.com

LATTES: <http://lattes.cnpq.br/4318087538278709>

² Bachelor's in Physical Education from Universidade Paulista (UNIP), Teresina, Piauí

E-mail: raialmeida75@gmail.com

³ Specialist in Development and the Environment (2012–2014)

Master's student at the Federal University of Piauí (UFPI), through the Office of Post Graduate Studies (PRPG), Center for Human Sciences and Letters (CCHL), and the Post Graduate Program in Geography (PPGGEO), Academic Master's in Geography

– Class 14 (2024–2026)

E-mail: wmachado-2011@hotmail.com

LATTES: <http://lattes.cnpq.br/3652789785115922>

⁴ Specialist in Sustainable Development and the Environment (2012), Teaching Sociology for High School at the State University of Piauí (UESPI, 2016), and Natural Sciences,

Their Technologies, and the World of Work at UFPI (2022)

Master's student at the Federal University of Piauí (UFPI), through the Office of Post Graduate Studies (PRPG), Center for Human Sciences and Letters (CCHL), and the Post Graduate Program in Geography (PPGGEO), Academic Master's in Geography

– Class 14 (2024–2026)

E-mail: profkjose@gmail.com

LATTES: <http://lattes.cnpq.br/6486047277790904>

⁵ Specialist in Brazilian Regional Geography from Faculdade de Venda Nova do Imigrante (FAVENI) and in Human and Social Sciences Applied to the World of Work, as well as Curriculum and Teaching Practice in the Early Years of Elementary Education, both from UFPI

Master's student at the Federal University of Piauí (UFPI), through the Office of Post Graduate Studies (PRPG), Center for Human Sciences and Letters (CCHL), and the Post Graduate Program in Geography (PPGGEO), Academic Master's in Geography

– Class 14 (2024–2026)

E-mail: carvalhonoe614@gmail.com

LATTES: <http://lattes.cnpq.br/7750716456039484>



activity, exploring the interaction between geographical space and practical experience. The results and discussion highlighted that trails and physical activities can promote health, environmental awareness, and sustainable tourism, provided there is an emphasis on the importance of conserving these spaces. Therefore, the integration of didactic devices aligned with environmental awareness enriches the teaching-learning process in Geography.

Keywords: Meaningful learning; Outdoor activities; Waterfall circuit; Didactic devices; Geography.



INTRODUCTION

The use of didactic devices such as Relive, Strava, and maps in QGIS allows for the establishment of guidelines for fieldwork and facilitates the understanding of fundamental concepts, transforming practice into an observation laboratory. This approach moves away from traditional Geography, which is centered on memorization, and promotes meaningful learning, essential for building geographical reasoning and valuing individual experiences.

The research hypothesis suggests that the experience on the trails improves participants' quality of life by integrating learning with the environment. Thus, this innovative methodology emphasizes the interaction of the individual with nature, contributing to a richer and more engaged social formation.

The choice of the Waterfall Circuit in Pedro II as the object of study is justified by its natural richness and tourism potential. The research aims to explore how the use of technologies and didactic devices can enrich the learning experience in field activities, in addition to contributing to the improvement of participants' quality of life. The relevance of the topic is accentuated by the need for geographic education that integrates theory and practice, promoting a deeper understanding of geographic space.

How can the integration of didactic devices and practical experiences on natural trails transform learning in Geography? What are the impacts of this approach on the safety and well-being of participants, especially beginners? And in what ways can these outdoor experiences contribute to the development of healthy habits and a greater connection with the environment?

The main objective of this work is to relate the experience of the trails and waterfalls in Pedro II to the practice of physical activity, exploring the interaction between geographic space and practical experience. Specifically, it seeks to: (I) Investigate how didactic devices such as Relive and Strava influence learning and safety on the trails; (II) Assess the benefits of outdoor activities for individuals' physical and mental well-being; (III) Analyze the importance of experienced guides in trail practice, especially for beginners; (IV) Discuss the relationship between practical experience in Geography and the formation of a more critical environmental awareness.

METHODOLOGY

The research is classified as applied, with a qualitative approach and bibliographic foundation. It describes and explains the stages of the study, which included in loco photographic records and the creation of a map in QGIS, representing the trails carried out in 2022 in the Waterfall Circuit, in Pedro II. The main focus was to contemplate the experience related to the natural aspects of the region, using different didactic devices.



The study was descriptive and based on the researcher's experiences, complemented by an interview conducted with a Physical Education professional on the day of the trails. The questions addressed recommendations to ensure the safety and well-being of beginners on trails, as well as perceptions regarding the use of technologies such as Strava and Relive in physical activities. The responses obtained are discussed throughout the chapter.

This approach is justified by the need to consider the concerns of students, teachers, and guardians when carrying out outdoor activities such as trails. Consulting experienced professionals or guides is essential to minimize risks, recognizing that these activities involve both benefits and challenges.

The research includes a section dedicated to discussing the different didactic devices used, as well as the representation of the route in the Waterfall Circuit, developed with QGIS. To enrich the geographical reflection, an experiential report from the researcher was incorporated, considering the Vygotskian logic in the construction of concepts such as consciousness, perception, memory, and thought (Morais, 2021). Two books were also used as references: *The Web of Life* by Capra (2006) and *The Nature of Space* by Milton Santos (1996).

Conducted in the Waterfall Circuit in Pedro II, Piauí, in 2022, the research involved trails of approximately 8.5 km. During these activities, devices such as Relive, Strava, and maps created in QGIS were used. Data collection included photographic records and interviews, which were analyzed qualitatively. Participants' experiences were compared with the theoretical foundation, using Vygotskian logic to understand psychological development during the activities. The research adhered to ethical guidelines, ensuring participants' consent and enabling a comprehensive understanding of the impacts of outdoor activities on learning and well-being.

RESULTS AND DISCUSSION

The use of trails and the encouragement of physical activity in geographic spaces in a conscious manner offer significant benefits for health, the environment, the local economy, social cohesion, and community education. This holistic approach can drive regional development sustainably, in addition to improving the population's quality of life.

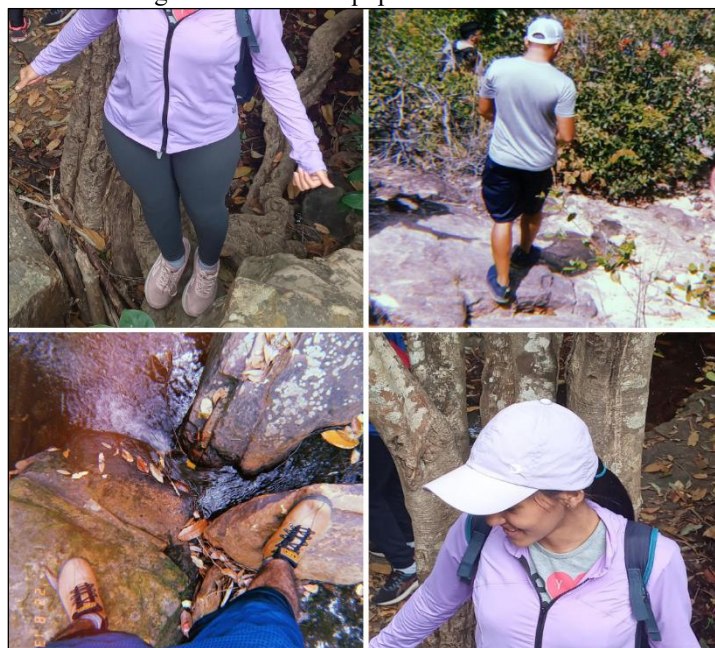
According to Costa and Silva (2007), adopting a healthy lifestyle through physical exercise provides individuals with greater resistance to stress, emotional stability, motivation, work efficiency, as well as improvements in self-image and interpersonal relationships. Kelley and Kelley (2013) also highlight that the practice of physical exercise contributes to health and quality of life, promoting improvements in cardiorespiratory fitness, body composition, and psychosocial well-being.

INTERVIEW WITH THE PHYSICAL EDUCATION PROFESSIONAL

In an interview with a Physical Education professional, recommendations were addressed to ensure the safety and well-being of beginners during trails in natural environments. The professional emphasized the importance of starting with easy routes and progressing gradually. It is essential to carry offline maps, energy snacks such as dried fruits and cereal bars, as well as water, to maintain energy during the activity. It is also crucial to avoid leaving traces in nature by collecting all waste. Proper preparation with essential equipment such as a backpack, appropriate footwear, and a first-aid kit is vital to ensure a safe and enjoyable experience.

For any field activity, a minimum level of prior preparation is necessary. In the Waterfall Circuit in Pedro II, for example, boots, sneakers, caps, light backpacks, water bottles, and energy snacks were used. This preparation is vital for the success of the trails, as illustrated in Figure 1

Figure 1 – Use of equipment for field trails



Source: Authors, 2022.

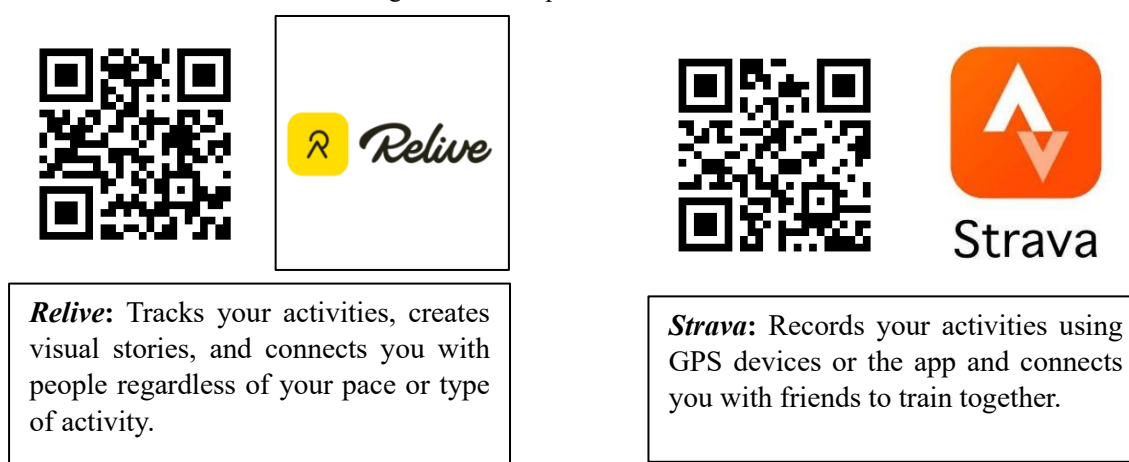
In the second question, the Physical Education professional was asked about the integration of technologies such as Strava and Relive in the practice of physical activities on trails and their impact on the user experience. She emphasized that these applications have significantly contributed to physical and mental well-being, as they provide greater safety for users during trails. With tools that allow performance monitoring, experience sharing, and connection with a community of practitioners, these applications enrich the outdoor experience. Furthermore, they offer valuable geographic data that help users orient themselves and stay focused on activities.

Technology can be applied in various field activities, being extremely useful by saving time and attention. The information generated by these applications can also be used in future academic work, as they offer resources such as offline maps and detailed data about the trails.

DIFFERENT DIDACTIC DEVICES

There are different types of applications that assist in trail practices, providing valuable resources for users. Among them, Relive and Strava stand out, offering specific functionalities to enhance the outdoor experience and ensure a safer and more rewarding practice (Figure 2).

Figure 2 – Examples of didactic devices

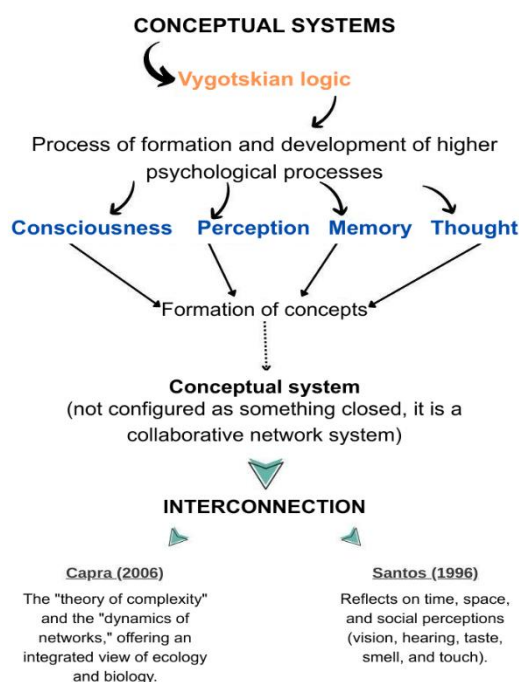


Source: Authors, 2024.

INTEGRATING PSYCHOLOGICAL AND THEORETICAL CONCEPTS INTO EDUCATIONAL PRACTICE

During the integrated recognition of the landscape, two fundamental books were considered: *The Web of Life: A New Scientific Understanding of Living Systems* by Capra (2006) and *The Nature of Space: Technique and Time, Reason and Emotion* by Milton Santos (1996). The formation of participants' concepts was carried out collaboratively, using Vygotskian logic (Morais, 2021), as illustrated in the conceptual system presented in Figure 3. This approach enabled a deeper understanding of the interactions between landscape elements and the concepts discussed.

Figure 3 – Integration of psychological and theoretical concepts into educational practice



Source: Authors, 2024.

Figure 3 addresses the interrelationship between various psychological and theoretical concepts, such as consciousness, perception, and memory, within the context of Vygotskian logic and conceptual systems. Capra's (2006) "theory of complexity" and Santos' (1996) reflection on time and space emphasize the importance of an integrated view that connects ecology, biology, and social perceptions.

When deepening the integrated study of the landscape, we encounter Bertalanffy's (2014) systems theory, which highlights the interconnection between society and nature. The concept of the Geosystem, developed by Sotchava, Bertrand, and Tricart in the 1960s, integrates natural, social, and cultural elements. Sotchava (1977) addresses three dimensions of analysis, Bertrand (1972) focuses on interactive dynamics, and Tricart (1977) explores environmental ecodynamics. Christofolletti (1998) relates the "environment" to the geosphere and biosphere, leading to the concept of Geoecology, applicable to geosystemic studies.

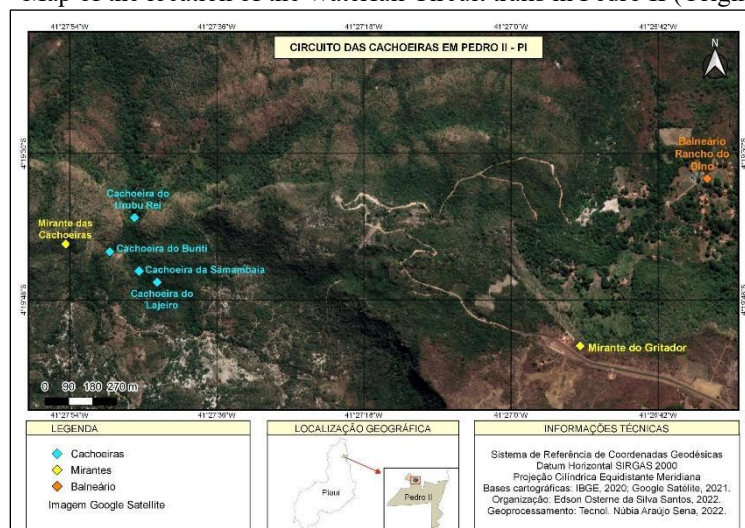
These concepts underpin the use of didactic devices such as Relive, Strava, and QGIS, which guide fieldwork and promote meaningful learning. Thus, the use of practical classes or technical visits in loco becomes an essential methodological proposal for this praxis.

RESEARCHER'S EXPERIENCE REPORT

In the Waterfall Circuit, the trail began at Morro do Gritador. After 2 km of walking, the first stop was at the waterfall viewpoint. Then, 400 meters further to Buriti Waterfall, followed by 500 meters to Samambaia Waterfall, and then 200 meters to Lajeiro Waterfall. The trail continued for 1.5 km to Urubu

Rei Waterfall, followed by a 2.5 km walk to the Rancho do Dino leisure area, where it was possible to rest and have a snack. The return to Morro do Gritador was made by car, totaling 8.5 km of walking on a difficult-level route that lasted the entire day. A map was created based on this route, as shown in Figure 4.

Figure 4 – Map of the location of the Waterfall Circuit trails in Pedro II (Original PT-BR)



The Waterfall Circuit in Pedro II – PI features four waterfalls — Urubu Rei, Buriti, Samambaia, and Lajeiro — along with two viewpoints, the Waterfalls Viewpoint and the Gritador Viewpoint, and the Rancho do Olho d’Água Spa. On the map, waterfalls are marked in blue, viewpoints in yellow, and the spa in orange, based on Google Satellite imagery.

Source: QGIS, 2022. Authors, 2022.

One of the main results of the research was that the integration between theory and practice, through the use of maps in QGIS, significantly improved the researcher’s performance. It is concluded that this combination is fundamental to promoting balanced and inclusive development in a given geographic area, in line with the interdisciplinary approach presented in this work. Regarding the first trail route, according to Barros et al. (2014, p. 31), it refers to the Gritador Viewpoint:

[...] it offers a view of the contact between the escarpment (Serra Grande Group, Jaicós Formation) of the Pedro II plateau and the planation surface, at the top of the Serra dos Matões. It corresponds to a canyon about 280 meters deep, at an altitude of 739 meters above sea level. From the viewpoint, one can have a privileged view of the valleys divided among Pedro II, Piracuruca, and Domingos Mourão. Throughout the valley, native vegetation and immense rock walls can be observed. The name “Gritador” comes from the echo produced by the sound bouncing off the geological structure of the walls, and, whether fact or legend, it is said that the communities living at the top and base of the hill used to communicate by shouting. The name derives from the production of echoes that reproduce the sound of a shout.

The viewpoint of the Serra Grande Group escarpment, located in Pedro II, offers a stunning view of a canyon that extends from 280 to 739 meters in altitude. The site displays valleys and native vegetation, and the name “Gritador” refers to the echo generated by the rock walls, which allowed

communities to communicate through shouts. Morro do Gritador can be seen in Figure 5, where the trails highlighted in Map 1 of Figure 4 also begin.

Figure 5 – Photograph of the Gritador Viewpoint



Source: Authors, 2022.

Experiencing new interactions with nature manifests uniquely for each individual, although the benefits associated with this interaction are widely recognized. During the exploration of some trail sections, evidence of the benefits of contact with the natural environment was identified, as illustrated in Figure 6. The phrase “There is no Wi-Fi in nature, but you will find a much better connection” went viral on social media and is often associated with Pedro II.

Figure 6 – Reflective phrase about the habit of connecting with nature



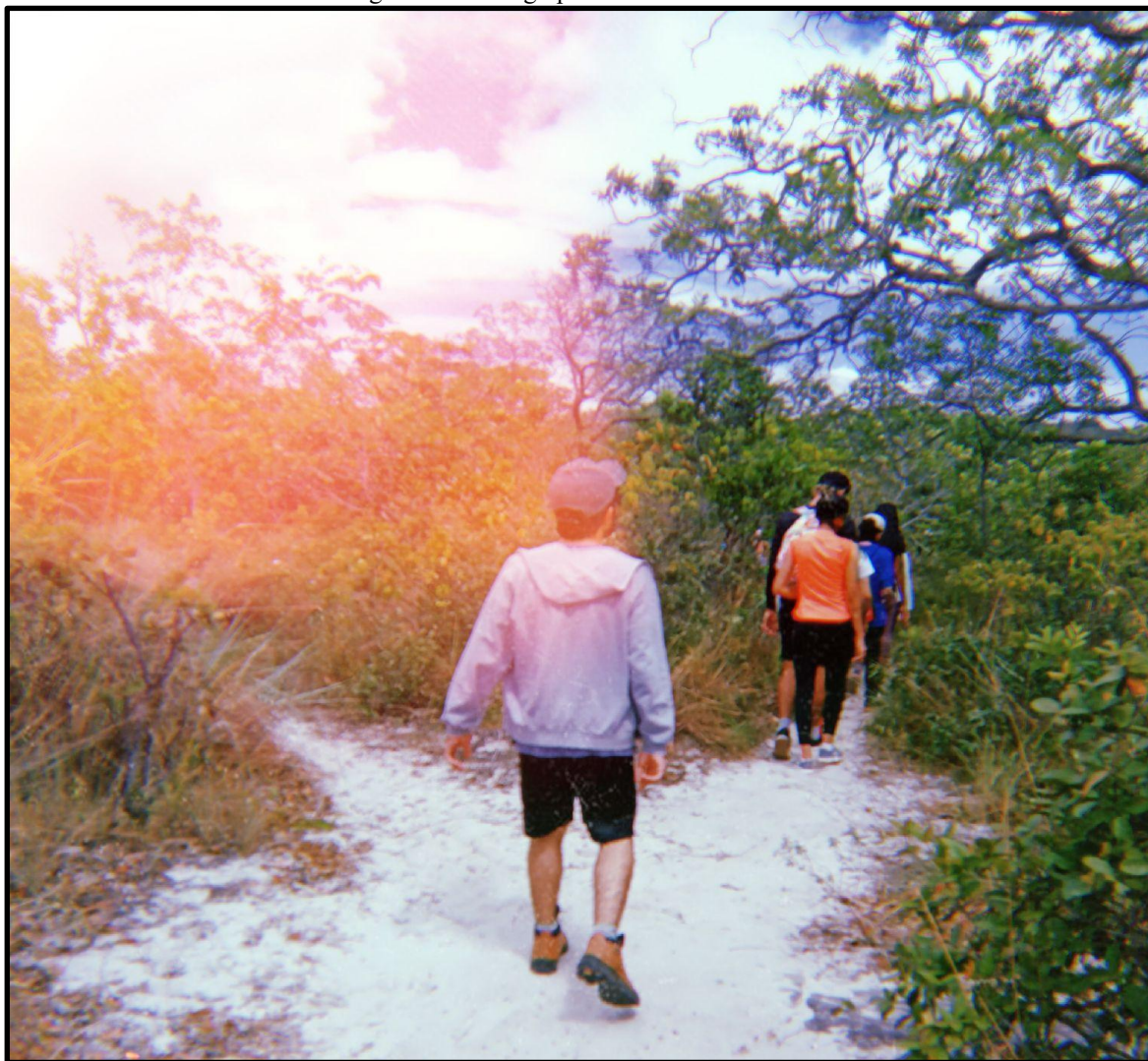
"There is no Wi-Fi in nature, but you will find a much better connection."

Source: Authors, 2022.

Although trails may initially seem like an informative alternative, they present a significant lack of data explaining the true meaning and relevance of this region. During the exploration, a concerning amount of solid waste was observed along all trails, evidencing the persistence of some people in disregarding the limits of the local environment. This situation not only compromises the landscape's aesthetics but also poses a threat to biodiversity and ecosystem health.

The trails have high tourism potential, as many landscapes are interconnected and promote the benefits of outdoor physical activities, adaptable to different age groups and skill levels. The Waterfall Circuit in Pedro II, illustrated in Figure 7, serves as an example of this interconnection. In addition to providing an enriching visual experience, this circuit highlights the importance of environmental awareness, encouraging practices of preservation and respect for nature.

Figure 7 – Photograph of the trail in Pedro II



Fonte: Dos próprios autores, 2022.

During the trail, we were accompanied by tour guides hired to lead us along the entire Waterfall Circuit route. We were in a group of 50 people, and some images of the waterfalls can be seen in Figure 8. To maximize tourism potential and ensure the region's sustainability, it is essential to implement environmental education strategies that inform visitors about the importance of preservation and respect for local ecosystems. These initiatives will not only contribute to biodiversity conservation but also enrich tourists' experiences, promoting a deeper connection with nature.

Figure 8 – Photograph of one of the waterfalls on the trail



Source: Authors, 2022.

Furthermore, promoting collective actions and active participation of the local community is essential to cultivate an environment of respect and responsibility toward natural heritage. By engaging the community and raising visitor awareness, we can establish a model of sustainable tourism that benefits both the local population and tourists, ensuring the preservation of natural resources for future generations.

These activities make regional development through trail tourism an effective way to interconnect economic, social, environmental, and institutional aspects, contributing to the improvement of the population's well-being. Trail tourism, therefore, not only promotes the appreciation of the environment but also integrates different elements in the regional development process, considering both positive and



negative impacts on the local community. This integrated approach is essential to ensure that tourism becomes a driving force for sustainable development, benefiting all stakeholders.

CONCLUSION

The integration of didactic devices such as Relive, Strava, and maps in QGIS not only transforms fieldwork in Geography but also enriches the learning experience by valuing participants' individual experiences. The results demonstrated that outdoor activities, such as the trails in the Waterfall Circuit, promote significant benefits for health, environmental awareness, and sustainable tourism, provided they are accompanied by adequate preparation and community engagement, ensuring the conservation of these spaces. Thus, this holistic approach contributes not only to a richer education connected to the environment and its different ecological niches but also to regional and sustainable development.



REFERENCES

1. Barros, José Sidiney et al. Geoparque Sete Cidades [Sete Cidades Geopark]. Pedro II-PI: proposta, 2014.
2. Bertalanffy, Ludwig Von. Teoria geral dos sistemas: fundamentos, desenvolvimentos e aplicações [General Systems Theory: Foundations, Developments and Applications]. 8. ed. Petrópolis: Editora Vozes, 2014.
3. Bertrand, Georges. Paisagens, geografia física global. Esboço metodológico [Landscapes, Global Physical Geography. Methodological Outline]. Caderno de Ciências da Terra, Vol. 13. São Paulo: USP, Instituto de Geografia, 1972.
4. Capra, Fritjof. A teia da vida: uma nova compreensão científica dos sistemas vivos [The Web of Life: A New Scientific Understanding of Living Systems]. 11. ed. São Paulo: Cultrix, 2006.
5. Christofletti, Antonio. Modelagem de sistemas ambientais [Modeling of Environmental Systems]. São Paulo: Edgar Blücher, 1998.
6. Costa, Maria Suêda; Silva, Maria Josefina da. Qualidade de vida e trabalho: o que pensam os enfermeiros da rede básica de saúde [Quality of Life and Work: What Nurses in Primary Health Care Think]. Revista de Enfermagem UERJ, p. 236-241, 2007.
7. Kelley, Tom; Kelley, David. Confiança criativa: desencadeando o potencial criativo dentro de todos nós [Creative Confidence: Unleashing the Creative Potential Within Us All]. Moeda, 2013.
8. Moraes, Eliana Marta Barbosa de. Vygotsky e a construção de sistemas conceituais: contribuições para a geografia escolar [Vygotsky and the Construction of Conceptual Systems: Contributions to School Geography]. In: Cavalcanti, Lana de Souza; Pires, Mateus Marchesan (Orgs.). Geografia escolar: diálogo com Vigotski [School Geography: Dialogue with Vygotsky]. Goiânia: C&A Alfa Comunicação, 2021. p. 73-89.
9. Relive. Relive: corra, pedale, trilhe e muito mais [Relive: Run, Ride, Hike and Much More]. Available at: <https://www.relive.cc/pt-BR>. Accessed on: December 6, 2024.
10. Santos, Edson Osterne da Silva. Mapa da localização das trilhas do Circuito das Cachoeiras em Pedro II [Map of the Location of the Waterfalls Circuit Trails in Pedro II]. 1 figure. QGIS, Geographic Information System. Version 3.10.3. [S.l.]: QGIS Development Team, 2019. Available at: https://download.qgis.org/downloads/QGIS-OSGeo4W-3.10.1-1-Setup-x86_64.exe. Accessed on: November 24, 2022.
11. Santos, Milton. A natureza do espaço: técnica e tempo, razão e emoção [The Nature of Space: Technique and Time, Reason and Emotion]. São Paulo: Hucitec, 1996.
12. Sotchava, Viktor Borisovich. O estudo de geossistemas [The Study of Geosystems]. Métodos em questão, 16. São Paulo: IG-USP, 1977.
13. Strava. Strava: relatórios de atividades e conexão social para atletas [Strava: Activity Reports and Social Connection for Athletes]. Available at: <https://www.strava.com/>. Accessed on: December 6, 2024.



14. Tricart, Jean. Ecodinâmica [Ecodynamics]. Rio de Janeiro: Fundação IBGE, 1977.